Abstract

A scintillation detector which includes a plurality of discrete scintillators composed of one or more scintillator materials. The discrete scintillators interact with incident radiation to produce a quantifiable number of photons with characteristic emission wavelength and decay time. A light guide is operatively associated with the scintillation crystals and may be either active or non-active and segmented or non-segmented depending upon the embodiment of the design. Photodetectors are provided to sense and quantify the scintillation light emissions. The process and system embodying various features of the present invention can be utilized in various applications such as SPECT, PET imaging and simultaneous PET systems. In accordance with the present invention, the detector array of the present invention incorporates either a single scintillator layer of discrete scintillators or discrete scintillators composed of two stacked different layers that can be the same scintillator material or of two different scintillator materials. In either case the different layers are composed of materials that have distinctly different decay times. The variants in these figures are the types of optical detectors which are used, i.e. photomultipliers and/or photodiodes, whether or not a segmented optical light guide is used, and whether the light guide is active or non-active. If a segmented optical light guide is used then the variant is whether the configuration is inverted or non-inverted.